October 24, 1989

Docket No. 50-443

Mr. Edward A. Brown
President & Chief Executive
Officer
New Hampshire Yankee Division
Public Service Company of New
Hampshire
Post Office Box 300
Seabrook, New Hampshire 03874

Dear Mr. Brown:

SUBJECT: SER ON SEABROOK SURGE LINE STRATIFICATION (TAC NO.72080)

The staff has completed its evaluation on the issue pertaining to thermal stratification in the pressurizer surge line of Seabrook Unit 1. The evaluation report is enclosed.

Our evaluation concludes that you have made acceptable efforts to meet the requested action item 2.a and 2.c of NRC Bulletin 88-11. Those efforts have demonstrated that the surge line meets the applicable design code. However, we request that you continue monitoring the surge line until the first refueling outage to ensure that the design thermal transients and stratification temperature profiles used at this time are indeed bounding for verifying code compliance. We would appreciate your response to the request to continue monitoring.

Original signed by:

Victor Nerses, Project Manager
Project Directorate I-3
Division of Reactor Projects I/II

Enclosure:
As stated

cc w/encl. See next page

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Adjudicatory File (2)
Atomic Safety and Licensing Board
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Washington, D.C. 20555

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ENCLOSURE

# SAFETY ANALYSIS REPORT ON

# SEABROOK SURGE LINE STRATIFICATION

## Introduction

In light of thermal stratification found in the pressurizer surge line of several PWRs, NRC issued Bulletin 88-11 on December 20, 1988. Since thermal stratification causes changes in piping stresses, fatigue life, and line deflections from those predicted in the original design, all licensees and NTOL applicants of PWR plants were requested to conduct visual inspection of the surge line; to update stress and fatigue analysis for ensuring code compliance, and to monitor thermal conditions and line deflections. Actions requested should be completed within periods specified in the Bulletin unless changes are considered acceptable to NRC.

## Evaluation

In response to the Bulletin's requested actions, the licensee submitted a letter (Reference 1) attached with a Westinghouse report (Reference 2) and a surge line isometric drawing (Reference 3) on March 7, 1989. Additional information for responding to staff questions was also provided in April, 1989 (Reference 4). On June 30, 1989, a detailed plant specific stress analysis of the surge line was submitted by the applicant (References 5 and 6). The submittals indicated that Seabrook Plant Unit 1 had conducted a walkdown after hot functional testing, instrumented sensors, and performed a quantitative assessment to show ASME Code Compliance. The following is the staff evaluation of information presented in References 1 to 6.

1. Section 5.1 in Reference 2 indicated that the result of the walkdown performed after hot functional testing by the licensee showed no signs of distress in the supports and there was no indication of any crushed insulation or signs of abnormal pipe movements. This is positive evidence that clearances around the pipe were adequate to accommodate piping thermal deflection by stratification.

2. We have reviewed locations of thermal and displacement monitoring points. Inconsistency in sensor locations were found in References 1, 2 and 3. In addition, their intended application was not described. The licensee clarified these matters in a conference call and a detailed monitoring location was provided in Reference 6 in conjunction with the description of the monitoring program.

3. We have reviewed a comparison of various operating parameters and thermal monitoring results in the Seabrook Plant, Unit 1 with those of four similar Westinghouse designed PWR plants in which plant-specific analyses were performed (Table 1 and 2 in Reference 4). We find that the Seabrook operating parameters and monitoring results are enveloped by the four plant specific analyses.

4. In Reference 5 and 6, we found that temperature and displacement data measured from recent heat up operations in the Seabrook Plant were incorporated into the bounding transient set for calculating the stratification induced thermal stresses. The licensee indicated that the monitoring would continue during the ascension phases of the plant startup to confirm that the plant-specific data remain within the limits of the bounding transient set. We believe, however, that the monitoring should continue until the next refueling outage to ensure that the thermal transients used in the Seabrook surge line design are indeed bounding, since some operational transients may not take place during the startup tests.

5. Fatigue evaluations of striping effects on the surge line was described in Reference 6. Our generic information from Westinghouse indicated that Westinghouse had conducted flow test in their Waltz Mill Laboratory. Striping amplitudes and frequencies were conservatively defined based on the test results. The attenuation effects of time and distance on the amplitude of thermal striping were also considered. We found that the approach for assessing the striping effects is conservative and calculation results are acceptable.

6. In Reference 6, methods and procedures used in calculating stratification effects were described. The calculated stresses and fatigue usage factors were combined with effects of other loadings including striping. We have reviewed the above information. We found that the approaches used are reasonable and the resultants of stresses and fatigue usage factors are within the FSAR committed Code allowables, which is delineated in Section III of the ASME Boiler and Pressure Vessel Code, 1977 Edition through 1979 summer addenda.

## Conclusions

Based on our review of information provided by the licensee in References 1 to 6, we conclude the licensee has made acceptable efforts to meet the requested action items 2.a and 2.c as delineated in NRC Bulletin 88-11. Their efforts have demonstrated that based on bounding input from Seabrook hot functional test and available stratification data of other five Westinghouse plants, the surge line meets the applicable design code. However, the licensee should be committed to continue monitoring the surge line until its first refueling outage to ensure that the design thermal transients and stratification temperatures profiles used at this time are indeed bounding for verifying code compliance.

References


1. Letter, Public Service of New Hampshire to NRC, "Response to NRC Bulletin 88-11; Pressurizer Surge Line Thermal Stratification", NYN-89023, March 7, 1989.

2. Westinghouse Report WCAP-12151 (Proprietary) and WCAP-12152 (Unrestricted), "Assessment of Thermal Stratification for the Seabrook Unit 1 Pressurizer Surge Line", attachment to Reference 1, February 1989.

3. Westinghouse piping isometric drawing. Pressurizer Surge Line of Seabrook Plant, Unit 1, Drawing No. SURG-W0049, attachment to Reference 1.

4. Westinghouse Report, Supplement 1 to WCAP-12151 (Proprietary) and WCAP-12152 (Unrestricted). "Additional Information in Support of the Assessment of Thermal Stratification for the Seabrook unit 1 Pressurizer Surge Line", April 1989.

5. Letter, Public Service of New Hampshire to NRC, "Follow-up Response to NRC Bulletin 88-11: Pressurizer Surge Line Thermal Stratification", NYN-89077, June 30, 1989.

6. Westinghouse Report WCAP-12305 (Proprietary) and WCAP-12306 (non-proprietary), "Evaluation of Thermal Stratification for the Seabrook, Unit 1 Pressurizer Surge Line", attachment to Reference 5, June 1989.